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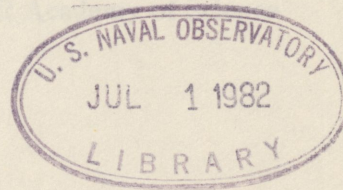
UNITED STATES NAVAL OBSERVATORY

C I R C U L A R N O . 1 6 4

U. S. Naval Observatory, Washington, D. C. 20390

December 29, 1981

ASTRONOMICAL DATA IN MACHINE READABLE FORM



This Circular was prepared by T. Corbin, A. B. Dudley, J. Baugh, M. Swain and P. K. Seidelmann. The data may be obtained by writing to the Director, Nautical Almanac Office, U. S. Naval Observatory, Washington, D. C. 20390. Magnetic tape duplicates are available for \$25 in U. S. currency. Check or money order should be payable to U. S. Naval Observatory. Requests should include specifications of mode (1 or 2 track), recording density (356, 500, 1600, 6250 bpi) and encoding (EBCDIC or ASCII). Reformatting will not be provided.

This Circular contains a list of machine readable data, generally of the astrometric variety, available at the U. S. Naval Observatory. It supersedes Circular 146 of April 19, 1974. The data listed in this circular generally represent material that has been prepared at the U. S. Naval Observatory.

The U. S. Naval Observatory is not an astronomical data center. The following data centers might be contacted as sources of stellar data:

Centre de Données Stellaires
Observatoire de Strasbourg
11, rue de l'Université
6700 Strasbourg, France

Astronomical Data Center
National Space Science Data Center
Code 601
NASA Goddard Space Flight Center
Greenbelt, MD 20771, USA

Soviet Astronomical Data Center
Astronomical Council of the USSR Academy of Science
48, Piatnitskaya Street
Moscow 109017, USSR

Astronomical Data Services
Computer Center
Kanazawa Institute of Technology
Kanazawa, 921 Japan

Astronomical Data Center
Zentralinstitut für Astrophysik
Rosa-Luxemburg-Strasse 17a
DDR-1500 Potsdam
German Democratic Republic

This Circular was prepared by T. Corbin, J. B. Dudley, J. Bangert, M. Sosslau and P. K. Seidelmann. The data may be obtained by writing to the Director, Nautical Almanac Office, U. S. Naval Observatory, Washington, D. C. 20390. Magnetic tape duplicates are available at \$25 in U. S. currency. Check or money order should be payable to U. S. Naval Observatory. Requests should include specifications of mode (7 or 9 track), recording density (556, 800, 1600, 6250 bpi) and encoding (EBCDIC or ASCII). Reformatting will not be provided.

(1) *The American Ephemeris and Nautical Almanac*

- (a) Through 1980: Daily values at 0^h E.T. of: apparent right ascension and declination, radius vector, semidiameter. Equation of time through 1967; ephemeris transit beginning 1968.
- (b) 1968–80: Daily value at 0^h E.T. of: longitude (mean equinox of year), reduction to apparent longitude, latitude (ecliptic of 1950.0, year, and date), horizontal parallax, precession in longitude, nutation in longitude and obliquity, and obliquity of ecliptic.
- (c) Ephemeris for physical observations, through 1980.

(2) *The Astronomical Almanac*

- (a) 1981–83: ecliptic longitude and latitude for mean equinox of date, apparent right ascension and declination, true distance from Earth.
- (b) 1981–83: position angle of axis, heliographic latitude and longitude horizontal parallax, semidiameter, ephemeris transit.

(3) *The Astronomical Almanac, Ephemerides for 1984 onward.*

- (a) Coordinates in series form, 1800–2050.
- (b) Coordinates at one day interval, unformatted IBM double-precision floating point representation, 1800–2050.
- (c) Formatted version of (b), 1800–1925.
- (d) Formatted version of (b), 1925–2050.

(4) *Astronomical Papers, Vol. XIV*

- (a) Left hand pages: spherical and rectangular coordinates of the Earth-Moon barycenter referred to 1950.0, 1800–2000.
- (b) Right hand pages: geocentric spherical (referred to date) and rectangular (referred to 1950.0) coordinates of the Sun, 1800–2000.

(5) Apparent longitude, referred to true equinox of date

- (a) For every 10 days, 100 B.C. — A.D. 1800.
- (b) Daily, 1800–2000.

(6) *Publications of the U. S. Naval Observatory*

Positions of the sun, moon and planets observed with the Six-Inch Transit Circle

- (a) Vol. XVI
 - (1) Part I, 1925–1941.
 - (2) Part III, 1941–1949.
- (b) Vol. XIX
 - (1) Part I, 1949–1956 W3₅₀.
 - (2) Part II, 1956–1962 W4₅₀.
- (c) Vol
 - (1) Part , 1962–1969 W5₅₀.

(7) *U. S. Naval Observatory Circular Nos. 103, 105, 108, 115, 118, 124, 127, 136, 143 and 159*

Preliminary positions of the sun, moon and planets observed with the Six-Inch Transit Circle between 1956 and 4 July 1977.

(8) *U. S. Naval Observatory Circular No. 138*

Geocentric solar data for each day in 1978 at 0^h U. T., referred to equator and equinox of date. Declination, equation of time, semidiameter and distance.

Also see Miscellaneous: The Nautical Almanac, right hand pages, The Air Almanac and Almanac for Computers.

(1) *The Astronomical Almanac and Improved Lunar Ephemeris*

- (a) $j=2$ (see p. vii, *American Ephemeris and Nautical Almanac*, 1972):
year, month, day, hour, Julian date, apparent right ascension and
declination, geometric horizontal parallax, apparent longitude,
geometric equatorial rectangular coordinates, mean equinox of
1950.0. Ten reels (1) 1800–1819, (2) 1820–1839,
(3) 1840–1859, (4) 1860–1879, (5) 1880–1899,
(6) 1900–1919, (7) 1920–1939, (8) 1940–1959,
(9) 1960–1979, (10) 1980–1999.
- (b) Ephemeris for physical observations, through 1983.

(2) *The Astronomical Almanac*, Ephemerides for 1984 onward.

- (a) Coordinates in series form, 1800–2050.
- (b) Coordinates at one day interval, unformatted IBM double-precision
floating point representation, 1800–2050.
- (c) Formatted version of (b), 1800–1925.
- (d) Formatted version of (b), 1925–2050.

(3) Geocentric equatorial rectangular coordinates in units of Earth's radius, referred
to 1950.0,

- (a) For every half day, 1952 January 1 through 1971 July 4.
- (b) For every quarter day, 1971 January 1 through 1980 December 31,
as published in *U. S. Naval Observatory Circular* No. 140,
Rectangular Coordinates of the Moon. 1971–1980.

(4) Apparent longitude and latitude, referred to true equinox of date, daily, 300
B. C.–A. D. 2074.(5) *Publications of the U. S. Naval Observatory*

Positions of the sun, moon and planets observed with the Six-Inch Transit
Circle

- (a) Vol. XVI
 - (1) Part I, 1925–1941.
 - (2) Part III, 1941–1949.
- (b) Vol. XIX
 - (1) Part I, 1949–1956 W3₅₀.
 - (2) Part II, 1956–1962 W4₅₀.
 - (3) Part III, 1925–1968.
- (c) Vol.
 - (1) Part ,1962–1969 W5₅₀.

(6) *U. S. Naval Observatory Circulars* Nos. 103, 105, 108, 115, 118, 124, 127, 136,
143 and 159

Preliminary positions of the sun, moon and planets observed with the Six-
Inch Transit Circle between 1956 and 4 July 1977.

Also see Miscellaneous: *The Nautical Almanac*, right hand pages, *The Air Almanac*
and *Almanac for Computers*

(1) *The American Ephemeris and Nautical Almanac*

- (a) Apparent right ascension and declination, semidiameter, horizontal parallax, true distance from Earth, ephemeris transit, daily through 1967. All planets except Pluto.
- (b) Apparent right ascension and declination, true distance from Earth and ephemeris transit, daily, 1968–1980, inclusive. All planets except Pluto.
- (c) Astrometric right ascension and declination, horizontal parallax, true distance from Earth, and ephemeris transit of Pluto, for every 4 days through 1980.
- (d) Heliocentric longitude and latitude, radius vector, orbital longitude, and daily motion of orbital longitude of Jupiter and Saturn, referred to mean equinox and ecliptic of date, for every 10 days, 1960 May 7 through 1982 January 31.
- (e) Heliocentric longitude and latitude, radius vector, orbital longitude, and daily motion of orbital longitude of Uranus, Neptune and Pluto, referred to mean equinox and ecliptic of date, for every 40 days, 1959 December 18 through 1982.
- (f) Ephemeris for physical observations of Mercury, Venus, Mars, Jupiter and Saturn through 1980.

(2) *The Astronomical Almanac*

- (a) Julian date, apparent right ascension and declination (Pluto, also astrometric right ascension and declination), true distance from Earth, ephemeris transit, daily, 1979 November 24 through 1985 February 4.
- (b) Julian date, longitude, latitude, radius vector, daily, 1979 November 24 through 1990 April 19.

(3) *The Astronomical Almanac*, Ephemerides for 1984 onward.

- (a) Coordinates in series form, 1800–2050.
- (b) Coordinates at one day interval, unformatted IBM double-precision floating point representation, 1800–2050.
- (c) Formatted version of (b), 1800–1925.
- (d) Formatted version of (b), 1925–2050.

(4) *Astronomical Papers*, Vol XII. Coordinates of the Five Outer Planets, 1653–2060.

- (a) 40-day values
- (b) 10-day values, subtabulated from 40-day coordinates, by date and planets.
- (c) 40-day values, by date and planet
- (d) 40-day values, reintegrated carrying more significant figures.

(5) Heliocentric coordinates of the five outer planets, 1800–2000, based on new mass values and a new fit to observations. Summary of basis in *Astronautics and Aeronautics*, August 1972, p. 63.

- (6) *Astronomical Papers*, Vol. XV, Part III, Heliocentric Coordinates of Venus, 1800–2000
- (a) 4-day values
 - (b) 4-day values, blocked 10 to a record
 - (c) 10-day values, unblocked
 - (d) 20-day values, blocked 10 to a record
- (7) *U. S. Naval Observatory Circulars* Nos. 90 and 95
- Provisional ephemeris of Mars based on Clemence's theory. Heliocentric equatorial rectangular coordinates, referred to mean equinox and equator of 1950.0, for every 4 days (a) 1800–1950 (b) 1950–2000
- (8) *U. S. Naval Observatory Circular* No. 96
- Geocentric distance and velocity of Venus referred to 1950.0, daily, 1960–1970, inclusive
- (9) *U. S. Naval Observatory Circular* No. 98
- Physical ephemeris of Mars based on a position of the north pole of $\alpha = 316^\circ 55' + 0^\circ 00' 65.33''$ (t–1905.0), $\delta = +52^\circ 85' + 0^\circ 00' 35.42''$ (t–1905.0), computed at a two day interval for sixty days centered at each opposition from 1877–1967
- (10) *Planetary Coordinates*, 1960–1980
- (a) Heliocentric equatorial rectangular coordinates of Mercury, referred to 1950.0, for every 5 days
 - (b) Longitude, latitude, radius vector and equatorial rectangular coordinates of Venus, Earth and Mars, referred to 1950.0, for every 10 days
- (11) Heliocentric equatorial rectangular coordinates and first derivatives of Venus and Earth–Moon barycenter, referred to 1950.0 daily, 1960–1970, inclusive
- (a) Coordinates
 - (b) Derivatives
- (12) Longitude, latitude and radius vector of Mercury, Venus and Mars, daily through 1980
- (13) (a) Heliocentric equatorial rectangular coordinates of all planets except Mercury, referred to 1950.0, by date and planet, for every 10 days 1800 January 4.5 through 2000 December 2.0. Venus, same as 6(c); Earth–Moon barycenter, same as Sun, 4(a); Mars, unpublished Herget integration; outer planets, same as 4(b).
- (b) Same as (a) but in reverse chronological order
 - (c) Same as (a), but includes Mercury at 1-day intervals

- (14) Position and Velocity of Earth with respect to Solar System barycenter.
Rectangular coordinates (as in *Astronomical Almanac* 1980–1985.)

- (15) *Publications of the U. S. Naval Observatory*

Positions of the sun, moon and planets observed with the Six-Inch Transit Circle

- (a) Vol. XVI

(1) Part I, 1925–1941

(2) Part III, 1941–1949

- (b) Vol. XIX

(1) Part I, 1949–1956 W3₅₀

(2) Part II, 1956–1962 W4₅₀

- (16) *U. S. Naval Observatory Circulars* Nos. 103, 105, 108, 115, 118, 124, 127, 136, 143 and 159.

Preliminary positions of the sun, moon and planets observed with the Six-Inch Transit Circle between 1956 and 4 July 1977

- (17) *U. S. Naval Observatory Circular* No. 106

Rectangular coordinates of Mercury, 1800–2000.

- (18) *U. S. Naval Observatory Circular* No. 162

Geocentric Ephemeris of Pluto 1975–1985 apparent and astrometric right ascension and declination, distance, horizontal parallax, and ephemeris transit.

Also see Miscellaneous: *The Nautical Almanac*, left hand pages, *The Air Almanac* and *Almanac for Computers*

(1) *The American Ephemeris and Nautical Almanac*

Astrometric right ascension and declination, true distance from Earth, ephemeris transit of Ceres, Pallas, Juno, and Vesta, daily through 1980

(2) *Astronomical Almanac*

Astrometric right ascension and declination, true distance from Earth, ephemeris transit of Ceres, Pallas, Juno and Vesta every two days 1981–1983.

(3) *Astronomical Papers*, Vol. XI, Part IV and Vol. XVI, Part III

Heliocentric equatorial rectangular coordinates of Ceres, Pallas, Juno and Vesta, referred to 1950.0 for every 20 days, 1920–1960

(4) *Astronomical Papers*, Vol. XX, Part II

Heliocentric equatorial rectangular coordinates of Ceres, Pallas, Juno and Vesta, referred to 1950.0 for every 10 days, 1928–2000

(11) Heliocentric equatorial rectangular coordinates and first derivatives of Venus and Earth-Moon barycenter, referred to 1950.0 daily, 1950–1970, inclusive

(a) Coordinates

(b) Derivatives

(12) Longitude, latitude and radius vector of Mercury, Venus and Mars, daily through 1980

(13) (a) Heliocentric equatorial rectangular coordinates of all planets except Mercury, referred to 1950.0, by date and planet, for every 10 days 1800 January 4.5 through 2000 December 2.0. Venus, same as 6(c); Earth-Moon barycenter, same as Sun, 4(a); Mars, unpublished Herget integration, outer planets same as 4(b).

(b) Same as (a) but in reverse chronological order

(c) Same as (a), but includes Mercury at 1-day intervals

Geocentric equatorial spherical

Sun (1a) (5a) (5b) (6) (7)

Moon (1a) (2) (5a) (5b) (6)

Planets (1a) (1b) (1c) (15a) (15b) (16) (18)

Minor Planets (1) (2)

The Nautical Almanac (Miscellaneous (5a) (5b))*The Air Almanac* (Miscellaneous (6))

Geocentric equatorial rectangular

Sun (4b)

Moon (3a) (3b)

Geocentric ecliptic spherical

Sun (1b) (2b) (4b)

Moon (1a)

Heliocentric equatorial rectangular

Earth (Sun (3))

Earth—Moon barycenter (Sun (4a))

Planets (3) (4) (5) (6) (7) (10) (11) (13) (17)

Minor Planets (3) (4)

Heliocentric ecliptic spherical

Earth—Moon barycenter (Sun (4a))

Planets (1d) (1e) (6a) (10b) (12)

- (1) Sidereal Time, through 1980
- (2) Equation of Time for 0^h U. T., 1965–1980
- (3) Nutation in longitude and obliquity, 1949 March 25 through 2009 June 18
- (4) Besselian and Independent Day Numbers
 - (a) referred to equinox of 1950.0, 1960–1971
 - (b) referred to nearest beginning of a year, 1960–1971, 1972–1980
- (5) *The Nautical Almanac*, 1964 through 1984
 - (a) Left hand pages: Greenwich hour angle and declination of Venus, Mars, Jupiter and Saturn, hourly; sidereal hour angle and declination of 57 stars for every third day
 - (b) Right hand pages: Greenwich hour angle and declination of Sun and Moon, hourly; sunrise–sunset, civil and nautical twilight, moonrise–moonset
- (6) *The Air Almanac*, 1964–1984
- (7) *Almanac for Computers*, 1977–1982
- (8) “A.1–UT1 Data.” Daily values of DUT1, x, y of pole (from BIH).

(1) *Publications of the United States Naval Observatory*

- (a) Vol. VIII, Catalogue of 1,201 Stars for 1900.0 (5" Alt-Az. Inst.)
- (b) Vol. IX
 - (1) Part I, Catalogue of 4,526 Stars for 1900.0 (W_{00}) (9" Tr. Cir.)
 - (2) Part IV, Catalogue of 196 Stars for 1900.0 (W_{00}) (9" Tr. Cir.)
- (c) Vol. X, Part I, Catalogue of 368 Stars for 1900.0 (Prime Vertical)
- (d) Vol. XI
 - (1) Catalogue of 215 Stars for 1910.0 (W_{10}) (6" Tr. Cir.)
 - (2) Catalogue of 2,499 Stars for 1910.0 (W_{210}) (6" Tr. Cir.)
- (e) Vol. XIII
 - (1) Catalogue of 10,571 Stars for 1920.0 (W_{20}) (9" Tr. Cir.)
 - (2) Appendix II, Catalogue of 818 Stars for 1925.0 (Prime Vertical)
- (f) Vol. XIV
 - (1) Part I, Catalogue of 3,520 Zodiacal Stars for 1925.0 (W_{ZOD}) (6" Tr. Cir.)
 - (2) Part II, Catalogue of 1,248 Stars for 1933.0 (W_{33}) (9" Tr. Cir.)
 - (3) Part III, Catalogue of 2,094 Stars for 1925.0 (5" Alt. Az. Inst.)
- (g) Vol. XV, Part V, Catalogue of 5,446 Stars for 1940.0 (W_{40}) (9" Tr. Cir.)
- (h) Vol. XVI
 - (1) Part I
 - (a) Catalogue of 2,383 Stars for 1925.0 (W_{25}) (6" Tr. Cir.)
 - (b) Catalogue of 1,536 Stars for 1950.0 (W_{50}) (6" Tr. Cir.)
 - (2) Part III, Catalogue of 5,216 Stars for 1950.0 (W_{250}) (6" Tr. Cir.)
- (i) Vol. XIX
 - (1) Part I, Catalogue of 5,965 Stars for 1950.0 (W_{350}) (6" Tr. Cir.)
 - (2) Part II, Catalogue of 2,554 Stars for 1950.0 (W_{450}) (6" Tr. Cir.)
- (j) Vol. XXI, Photoelectric Catalogue (1968). Magnitudes and Colors of Stars in the U, B, V and U_c , B, V systems (20,705 stars).

- (2) *Astronomical Papers*, Vol. VIII, Part II, Catalogue of Fundamental Stars for 1875.0 and 1900.0 (Newcomb).
- (3) *Astronomical Papers*, Vol. VIII, Part III, Catalogue of 1,607 Zodiacal Stars for 1900.0 and 1920.0 (Hedrick).
- (4) *Astronomical Papers*, Vol. X, Part I, Positions and Proper Motions of 1,504 Standard Stars for 1925.0 (Eichelberger).
- (5) *Astronomical Papers*, Vol. X, Part II, Catalogue of 3,539 Zodiacal Stars for 1950.0 (Robertson).
- (6) *Astronomical Papers*, Vol. XIII, Part III, N30, Catalogue of 5,268 Standard Stars for 1950.0 (Morgan).
- (7) Abbadia: Catalogue of 13,532 Stars, $\delta +5^\circ$ to -3° for 1900.0.
- (8) Abbadia: Catalogue of 14,263 Stars, $\delta +16^\circ$ to $+24^\circ$ for 1900.0.
- (9) Abbadia: Catalogue of 7,443 Stars, $\delta -3^\circ$ to -9° for 1900.0.
- (10) AG: Nikolaev, $\delta -2^\circ$ to $+1^\circ$, Catalogue of 5,954 Stars for 1875.
 Strasbourg, $\delta -2^\circ$ to -6° , Catalogue of 8,204 Stars for 1900.
 Vienna, $\delta -6^\circ$ to -10° , Catalogue of 8,468 Stars for 1900.
 Cambridge, $\delta -10^\circ$ to -14° , Catalogue of 8,337 Stars for 1900.
 Washington, $\delta -14^\circ$ to -18° , Catalogue of 8,824 Stars for 1900.
 Algiers, $\delta -18^\circ$ to -23° , Catalogue of 9,997 Stars for 1900.
- (11) Albany: *Preliminary General Catalogue of 6,188 Stars for 1900.0*.
- (12) Albany: *General Catalogue of 33,342 Stars for 1950.0*.
- (13) Albany: *Catalogue of 20,811 Stars for 1910.0* (Appendix, 1,125 stars).
- (14) Albany *Zone Catalogues of 8,276 stars between -20° and -41° and of 2,800 stars between -2° and $+1^\circ$ for 1900*.
- (15) AGK2: Second Catalogue of the Astronomische Gesellschaft, (183,588 stars for 1950.0).
- (16) AGK2A: Catalogue of 13,747 Reference Stars for the AGK2 for 1950.0.
- (17) AGK3: *Star Catalogue of Positions and Proper Motions North of -2.5°* (183,173 stars for 1950.0).
- (18) AGK3R: Catalogue of Reference Stars for the AGK3, $\delta -5^\circ$ to $+90^\circ$ (21,499 stars for 1950.0).
- (19) *Catalogue of Mean Positions and Proper Motions for 20,194 AGK3R Stars, -5° to $+90^\circ$, for 1950.0 (The Northern IRS Stars)*.

- (20) Belgrade: *Astronomical Publications*, No. 17, Part II, Catalogue of Declinations of the Latitude Program Stars—KSZ (3,957 stars for 1950.0).
- (21) Belgrade: *Astronomical Publications*, No. 17, Part III, List of Individual Corrections of the Declinations of Fundamental Stars from FK4 (450 stars for 1950.0).
- (22) Bergedorf: First Bergedorf Catalogue for 1925.0 (4,983 stars).
- (23) Bergedorf: *Katalog von 3,356 Schwachen Sternen* for 1950.0 (Larink).
- (24) Berlin: *Veröffentlichungen Berlin—Babelsburg*, BD I, Part 2, Catalogue of 1886 Stars, $\delta +70^\circ$ to $+90^\circ$, for 1910.0.
- (25) Berlin: *Veröffentlichungen Berlin—Babelsburg*, BD V, Part 5, Catalogue of 8803 Stars, $\delta +31^\circ$ to $+40^\circ$, for 1920.0.
- (26) Bonn: *Veröffentlichungen der Königlichen Sternwarte zu Bonn*, No. 10, Catalogue of 10,663 Stars from $\delta 0^\circ$ to $+51^\circ$ for 1900.0.
- (27) Bonn: *Veröffentlichungen der Universitäts—Sternwarte Bonn*, No. 16, Catalogue of 2,199 Stars for 1900.0.
- (28) Bonn: *Veröffentlichungen der Universitäts—Sternwarte Bonn*, No. 20, Catalogue of 1,823 Intermediary Stars, $\delta +50^\circ$ to $+90^\circ$, for 1925.0.
- (29) Bordeaux: Meridian Circle Observations, $\delta +11^\circ$ to $+18^\circ$, Catalogue of 2,024 Reference Stars for 1950.0 (Semiot).
- (30) Bordeaux: Second Catalogue of the Bordeaux Observatory, $\delta +10^\circ$ to $+18^\circ$ (7,038 stars for 1900.0).
- (31) Bordeaux: New Observations of the Stars Contained in the Second Catalogue of Bordeaux (12,615 observations for 1900.0).
- (32) Brorfelde: *Meridian Observations, 1964—1967, Catalogue of 972 Stars for 1950.0*.
- (33) Brussels: *Ann. de l'Observatoire de Belgique*, Vol. 2, No. 4, Catalogue of 1,339 Fundamental Stars from $\delta -30^\circ$ to $+90^\circ$ for 1925.0.
- (34) Bucharest: *KSZ Catalogue of Faint Stars for 1950.0*; $\delta -11^\circ$ to $+11^\circ$ (3,939 stars).

- (35) *Cape Zone Catalogue for 1900.0*
 (a) $\delta -40^\circ$ to -52° (20,843 stars)
 (b) Also precessed to 1950.0 (20,843 stars).
- (36) *Cape Fundamental Catalogue of 1293 Stars for 1900.0.*
- (37) *Second Cape Fundamental Catalogue for 1900.0* (1,846 stars).
- (38) *Cape General Catalogue for 1900.0* (4,464 stars).
- (39) *Cape Catalogue of 1,680 Stars for 1900.0.*
- (40) *First Cape Catalogue for 1925.0* (4,569 stars).
- (41) *Second Cape Catalogue for 1925.0* (11,667 stars).
- (42) *Third Cape Catalogue for 1925.0*, $\delta 0^\circ$ to -30° (6,597 stars).
- (43) *First Cape Catalogue for 1950.0* (5,070 stars).
- (44) Second Cape Catalogue for 1950.0, *Cape Annals*, Vol. 23, (6,763 stars plus 417 polar stars).
- (45) Cape Photographic Catalogue for 1950.0, *Cape Annals*, Vols. 17, 18, 19, 20, 21 and 22, $\delta -30^\circ$ to -40° and -52° to -90° (138,466 stars).
- (46) Meridian Positions of Standard Stars for the Cape Photographic Catalogue, *Cape Annals*, Vols. 17, 18, 19, 20, 21 and 22, $\delta -30^\circ$ to -40° and -52° to -90° (10,312 stars for 1950.0).
- (47) Cape: *Catalogue of 8,560 Astrographic Standard Stars Between Declinations -40° and -52° for 1900.0.*
- (48) Cincinnati: *Publications of the Cincinnati Observatory*, No. 22, Catalogue of 2,300 Stars for the Epoch 1925.0.
- (49) Cincinnati: *Publications of the Cincinnati Observatory*, No. 19, A Catalogue of 4,683 Stars for the Epoch 1900.0.
- (50) Cordoba A, *Resultados*, Vol. 22, Catalogue of 15,975 Stars, $\delta -22^\circ$ to -27° , for 1900.0.
- (51) Cordoba B, *Resultados*, Vol. 23, Catalogue of 15,200 Stars, $\delta -27^\circ$ to -32° , for 1900.0.
- (52) Cordoba C, *Resultados*, Vol. 24, Catalogue of 12,757 Stars, $\delta -32^\circ$ to -37° , for 1900.0.
- (53) Cordoba D, *Resultados*, Vol. 38, Catalogue of 16,610 Stars, $\delta -37^\circ$ to -47° for 1950.0.
- (54) Cordoba E, *Resultados*, Vol. 39, Catalogue of 1,919 Stars, $\delta -81^\circ$ to -90° , for 1950.0.
- (55) Cordoba: *Resultados*, Vol. 34, Catalogue of 6,429 Reference Stars, $\delta -24^\circ$ to -31° , for 1900.0.
- (56) Cordoba: *Resultados*, Vol. 37, Fundamental General Catalogue for 1950.0 (761 stars; Supplement, 231 stars).

- (57) Third Fundamental Catalogue (FK3) (1,591 stars for 1925.0 and 1950.0).
- (58) *Fourth Fundamental Catalogue (FK4)* (1,535 stars for 1950.0 and 1975.0).
- (59) New Fundamental Catalogue of the Berliner Astronomisches Jahrbuch (NFK) (925 stars for 1875.0 and 1900.0).
- (60) Auwers: *Fundamental Catalog (FC)* (539 stars for 1875.0).
- (61) Greenwich: *First Greenwich Catalogue of Stars for 1950.0*
 Part I: 1,399 fundamental stars
 Part II: 6,173 stars, δ 0° to $+24^\circ$.
- (62) Greenwich: Individual observations of stars given in the Greenwich *Observations* 1830 through 1913 (383,500 observations).
- (63) Greenwich: *Greenwich Catalogue of Stars for 1910.0*, δ $+24^\circ$ to $+32^\circ$ (12,368 stars).
- (64) Greenwich: *First Greenwich Catalogue of Stars for 1925.0* (2,643 stars).
- (65) Greenwich: *Second Greenwich Catalogue of Stars for 1925.0*
 Part I: 2,111 fundamental stars
 Part II: 10,584 stars, δ $+32^\circ$ to $+64^\circ$.
- (66) Heidelberg: *Veröffentlichung Der Sternwarte Heidelberg* BD V, No. 2 Catalogue of Zodiacal Stars for 1900.0 (2,798 stars) (Gill's Zodiacal Stars).
- (67) Königsberg: *Astronomische Beobachtungen*, Vol. 42, Catalogue of Right Ascensions for 4,066 Zodiacal Stars, for 1900.0.
- (68) Königsberg: *Astronomische Beobachtungen*, Vol. 44, Catalogue of 546 Stars, δ $+50^\circ$ to $+55^\circ$ for 1925.0.
- (69) Königsberg: *Astronomische Beobachtungen*, Vol. 46, Catalogue of 2,043 Stars, δ $+50^\circ$ to $+55^\circ$ for 1925.0.
- (70) Kazan: Differential Catalogue of Declinations for 2,288 KSZ Stars for 1950.0.
- (71) La Plata A, *Publicaciones*, Vol. V, Catalogue of 7,412 Stars between -52° and -57° for 1925.0.
- (72) La Plata B, *Publicaciones*, Vol. VII, Catalogue of 7,792 Stars between -57° and -62° for 1925.0.
- (73) La Plata C, *Publicaciones*, Vol. VIII, Catalogue of 4,412 Stars between -62° and -66° for 1925.0.
- (74) La Plata D, *Publicaciones*, Vol. IX, Catalogue of 4,513 Stars between -66° and -72° for 1925.0.
- (75) La Plata E, *Ser. Astr.*, Vol. 10, No. 1, Catalogue of 2,486 Stars between -72° and -82° for 1925.0.
- (76) La Plata F, *Ser. Astr.*, Vol. 13, Catalogue of 4,828 Stars between -46° and -52° for 1935.0.

- (77) La Plata: *Publicaciones*, Vol. 11, No. 1, 890 Kapteyn Stars for 1925.0.
- (78) La Plata: *Publicaciones*, Vol. 11, No. 2, Catalogue of Eros Stars (496 stars for 1930.0).
- (79) La Plata: *Ser. Astr.*, Vol. 15, Reobservation of 890 Kapteyn Stars for 1925.0.
- (80) La Plata: *Ser. Astr.*, Vol. 19, Catalogue of 3,710 Southern Stars for 1950.0.
- (81) La Plata: *Ser. Astr.*, Vol. 30, 6,744 Stars from the Boss General Catalogue, $\delta -47^\circ$ to -82° , for 1950.0.
- (82) Leiden: *Annals*, Vol. XV, No. 1, A Catalogue of Positions and Proper Motions of 1,533 Red Stars for 1925.0.
- (83) Leiden: *Annals*, Vol. XV, No. 2, Catalogue of 1,073 Stars in the Zone $+55^\circ$ to $+60^\circ$ for 1925.0.
- (84) Leiden: *Annals*, Vol. XV, Pt. 4, General Catalogue of Positions and Proper Motions for 1,190 Standard Stars for 1925.0.
- (85) Lick Observatory: *Publications*, No. 10, Catalogue of Zodiacal Stars (2,798 stars for 1900.0).
- (86) Lick Observatory: *Publications*, No. 15, Observed Places of Harvard AG Stars for 1917.0 (1,069 stars).
- (87) Lick Observatory: *Bull.* No. 15, Meridian Circle Observations of 1,188 Stars between 20° and 30° North Declination, for 1928.0.
- (88) Lund Observatory: *Annals*, No. 11, Meridian Observations of Faint AG Stars (6,099 stars for 1950.0).
- (89) Lund Observatory: *Annals*, No. 13, Meridian Observations of Miscellaneous Stars (1,190 stars for 1950.0).
- (90) Lund Observatory: Catalogue of 11,800 Stars for the AG Zone $+35^\circ$ to $+40^\circ$, for 1925.0.
- (91) Madison: *Washburn Observatory Publications*, Vol. XII, Part 2, Catalogue of 2,786 Stars, $\delta -21^\circ$ to $+30^\circ$ for 1910.0.
- (92) Melbourne: *Second Melbourne General Catalogue of 1,211 Stars for the Epoch 1880.0*.
- (93) Melbourne: *Third Melbourne General Catalogue of 3,068 Stars for the Equinox 1890.0*.
- (94) Melbourne: *Catalogue of Declinations of 2,249 Backlund-Hough List Stars for 1950.0 Observed at Melbourne during 1928–1941*.
- (95) Moscow: *Moscow Universitet Soobshchenia*, No. 97–98, Catalogue of Faint Stars (545 stars for 1950.0).

(96) Córdoba: *Resultados*, Vol. 37, Fundamental Catalogue of 1,825 Stars (761 stars; Supplement, 231 stars).

- (96) Moscow: Corrections to the Positions of the FK3 Stars, (328 stars for 1950.0), *Trudy*, Vol. 77, Part B.
- (97) Moscow: Catalogue of Right Ascensions and Declinations of KSZ Stars in the Zone $+60^\circ$ to $+90^\circ$ (1,323 stars for 1950.0), *Trudy*, Vol. 42.
- (98) Moscow: Catalogue of Right Ascensions and Declinations of KSZ Stars in the Zone $+45^\circ$ to $+60^\circ$ (1,612 stars for 1950.0), *Trudy*, Vol. 45.
- (99) Munich: *Neue Annalen München*, BD VI, Heft 1, Catalogue of 1,867 Stars, $\delta +40^\circ$ to $+45^\circ$ and $+55^\circ$ to $+60^\circ$ for 1900.0.
- (100) Nice: Fayet, Catalog of Intermediary Stars Observed with the Meridian Circle at Nice, $\delta +5^\circ$ to $+15^\circ$ (964 stars for 1910.0).
- (101) Nice: Fayet, Catalogue of Positions and Proper Motions of Intermediary Stars, $\delta -5^\circ$ to $+5^\circ$ (1,020 stars for 1925.0).
- (102) Ottawa: *Publications*, Vol. XV, No. 3, Catalogue of 1,525 Stars for 1950.0.
- (103) Ottawa: *Publications*, Vol. XV, No. 2, Catalogue of 1,589 Stars for 1925.0.
- (104) Paris: Catalogue of 26,262 Stars for 1890.0.
- (105) Paris: Catalogue of 10,556 Reference Stars $\delta +16^\circ$ to $+24^\circ$ for 1900.0.
- (106) Perth: *Meridian Observations*:
 - Vol. 2, A Catalogue of 1,625 Stars between 39° and 41° South Declinations for 1900.0.
 - Vol. 3, A Catalogue of 1,846 Stars between 33° and 35° South Declinations for 1900.0.
 - Vol. 4, A Catalogue of 2,047 Stars between 31° and 33° South Declinations for 1900.0.
 - Vol. 5, A Catalogue of 2,043 Stars between 35° and 37° South Declinations for 1900.0.
 - Vol. 6, A Catalogue of 2,025 Stars between 37° and 39° South Declinations for 1900.0.
- (107) Pulkovo: *Publications of Pulkovo*, Series II, Vol. XLIX, Right Ascensions of 1,904 Stars for 1915.0.
- (108) Pulkovo: *Publications of Pulkovo*, Series II, Vol. LVII, Absolute Declinations of 1,904 Stars for 1915.0.
- (109) Pulkovo: *Publications of Pulkovo*, Series II, Vol. LXXII, PFKSZ: A Preliminary General Catalogue of Fundamental Faint Stars, $+90^\circ$ to -20° (587 Stars for 1950.0).
- (110) Pulkovo: *Publications of Pulkovo*, Series II, Vol. XLI, Catalogue of 3,396 Stars between 39° and 46° North Declinations for the Equinox 1910.0.
- (111) Pulkovo: *Publications of Pulkovo*, Series II, Vol. LXXVII, Catalogue of 2600 KSZ Stars in the Zone -5° to -20° for the Equinox 1950.0.
- (112) Pulkovo: *Publications of Pulkovo*, Series II, Vol. LVI, A Catalogue of 8820 Stars from -15° to $+15^\circ$ for the Equinox 1900.0.

- (113) San Luis: *Carnegie Inst. Publication* 386, Catalogue of 15,333 Stars for 1910.0.
- (114) Smithsonian Astrophysical Observatory, Star Catalogue: *Positions and Proper Motions of 258,997 Stars for the Epoch and Equinox of 1950.0.*
- (115) Strasbourg: *Strasbourg Annals*, Vol. IV, Catalogue of 2,251 Faint Stars Reduced to 1930.0.
- (116) Sydney: *Catalogue of 1,499 Intermediate Stars*, $\delta -30^\circ$ to -51° for 1925.0.
- (117) Sydney: *Catalogue of 1,068 Intermediate Stars*, $\delta -51^\circ$ to -65° for 1900.0.
- (118) Tashkent: *Astron. Obs.*, No. 319, Catalogue of Right Ascensions of 824 Stars, $\delta -15^\circ$ to -20° for 1950.0.
- (119) Tashkent: *Astron. Obs.*, No. 325, Catalogue of Right Ascensions of 814 KSZ Stars, -10° to -15° for 1950.0.
- (120) Tokyo: *Annals*, Series 2, Vol. 2, Catalogue of Zodiacal Stars, (Mitaka) (2790 stars for 1950.0).
- (121) Toulouse: *Annals*, Vol. XIII, Third Catalogue of Toulouse, $\delta +3^\circ$ to $+12^\circ$ (10,070 stars for 1900.0).
- (122) Toulouse: *Annals*, Vol. XVI, Third Catalogue of Toulouse, Appendix II (2,213 stars for 1900.0).
- (123) Trieste: Catalogue of 2,390 stars for 1925.0.
- (124) Yale University Observatory *Transactions*, Vols. 11–14, 16–22, 24–31.

Declinations °	Stars	Declinations °	Stars
+85 to +90	$\left\{ \begin{array}{l} X = 1,031 \\ Y = 1,031 \\ a = 1,031 \\ \delta = 1,031 \end{array} \right.$	$\begin{array}{l} -2 \text{ to } +1 \\ -2 \text{ to } -6 \\ -6 \text{ to } -10 \\ -10 \text{ to } -14 \end{array}$	$\begin{array}{l} 5,583 \\ 8,108 \\ 8,248 \\ 8,101 \end{array}$
+55 to +60	8,164	-14 to -18	8,563
+50 to +55	8,380	-18 to -20	4,553
		-20 to -22	4,292
+25 to +30	10,358	-22 to -27	15,110
+20 to +25	8,703	-27 to -30	9,455
+15 to +20	9,092	-30 to -35	12,876
+10 to +15	8,967	-35 to -40	12,120
+ 9 to +10	1,906	-40 to -50	17,373
+ 5 to + 9	9,060	-70 to -90	18,702
+ 1 to + 5	7,996		

Cross References:

- (a) Boss Catalogue star number, Henry Draper star number
- (b) Boss Catalogue star number, Henry Draper star number, FK3 star number, Durchmusterung number
- (c) Same as (b) but in order of Henry Draper number.

Henry Draper Catalogue and Extension, *Harvard Observatory Annals*, Vol 91–100 (272,150 stars).

Kukarkin, *General Catalogue of Variable Stars*

- (a) Second edition (14,708 stars)
- (b) First Supplement to the second edition:
 - (1) 1,647 stars.
 - (2) 796 stars.

Wilson, *General Catalogue of Stellar Radial Velocities*, 1953 (15,106 stars.)

Yale, *Catalog of Bright Stars* (Third Revised Edition, 1964) (9,091 stars.)

Yale, *General Catalogue of Trigonometric Stellar Parallaxes*, 1952 and Supplement, 1963 (6,677 stars).